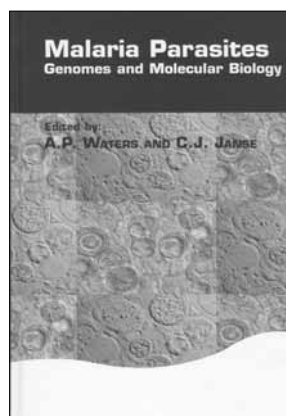


BOOK REVIEWS

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Malaria Parasites. Genomes and Molecular Biology

ANDREW P. WATERS,
CHRIS J. JANSE (EDS)

2004. Caister Academic Press, Norfolk, UK
 546 pp, 24 × 16 cm
 Price: US\$ 230
 ISBN 0-9542464-6-2

The book *Malaria Parasites: Genomes and Molecular Biology* presents an overview of the tasks that were involved in obtaining and deciphering parasite DNA sequences that led to the completion of the *Plasmodium falciparum* Genome Project. It represents a complete guide for researchers interested in genome analysis and the molecular biology of *P. falciparum* and other *Plasmodium* parasites. The information gathered in the 16 chapters, authored by well-known specialists in the corresponding fields, is of great relevance for readers interested in anti-malaria vaccine development, drug discovery, and the analysis of parasite genes and proteins using bioinformatics, as well as in understanding the biology of *Plasmodium* and related parasites.

The Introduction transmits a sense of the tremendous effort, in terms of funding and human and technical resources, that the *P. falciparum* Genome Project required. Five institutions, initially, the Burroughs Wellcome Fund, the National Institute of Allergy and Infectious Diseases (NIAID), the US Department of Defense, and the Wellcome Trust, later joined by the World Health Organization, provided the funds. Four other centers, the Sanger Center, Stanford University, The Institute for Genomic Research (TIGR), and the US Naval Medical Research Center (NMRC) provided the infrastructure as well as the personnel. From the start, the results of the project were quickly made available through the PlasmoDB database [<http://PlasmoDB.org>], and standardized reagents related to the ongoing research, and to malaria research in general, could be obtained through the establishment of the Malaria Research and Reference Reagent Resource (MR4).

In the first chapter, N. Hall and M. Gardner describe the beginnings of the *Plasmodium falciparum* Genome Project—the first large-scale genetic analysis of a eukaryotic pathogen—and the final results of the sequencing of the organism's 14 chro-

mosomes. The following chapter (The genome of model malaria parasites, and comparative genomics, by J. Carlton, J. Silva, and N. Hall) explores general aspects of the comparative genomics and chromosome structure of *P. falciparum* and other protozoans from the same genus, including *P. vivax*, *P. yoelii*, *P. chabaudi*, *P. berghei*, and *P. knowlesi*. Complementing the data provided in those chapters, A. Scherf, L.M. Figueiredo, and L.H. Freitas, Jr., present an in-depth study of the subtelomeric regions of the *Plasmodium* chromosomes (Chap. 7). In Chap. 8, there is another excellent review, by K.W. Deitsch, on the regulation of gene expression in *Plasmodium*, in which both the epigenetic control of gene expression and the transcriptional control of the *var* genes, responsible for antigenic variation and escape of the parasite from the host's immune response, are emphasized. The genome analyses carried out thus far have been limited compared to the promise of those that can be done on whole genomes of the various malaria parasites that have already been sequenced or that are currently in development. In Chap. 3, J.C. Kissinger and D.S. Roos describe how these data can be exploited and the corresponding bioinformatics resources that will be essential for such analyses. The strength and weakness of these methods and the requirements for a critical evaluation of the results are discussed.

Working knowledge of the tools necessary to manipulate the expression of parasite genes is important to be able to identify their functions. In Chap. 4, T. Gil Carvalho and R. Ménard describe different ways to examine gene function that have been or have the potential to be applied to *Plasmodium*. The authors show how the technology to genetically transform the parasites in order to study gene function or promoter activity has evolved since the first report of parasite transfection was published, in 1993. *Toxoplasma gondii* is a *Plasmodium*-related Apicomplexa parasite. In Chap. 5, D. Soldati and M. Meissner offer insight into how classes of genes unique to this phylum can be analyzed in *T. gondii*, aiming at a possible identification of common targets for intervention. Experimental approaches for genetic and biological research on *T. gondii* are also described. It is worth mentioning that the results of the *T. gondii* sequencing project can also be consulted in the corresponding database website [<http://ToxoDB.org>]. The genomic analysis of *P. falciparum* has revealed an abundance of microsatellite (MS) markers. These are useful for dissecting gene function, identifying vaccine candidates and drug targets, and elucidating the evolutionary history of the parasites. In Chap. 6, D. Joy, J. Mu, and X. Su present an overview of the MS markers of *P. falciparum* and their applications in studying population genetics.

One feature of *Plasmodium* parasites, already known well before the completion of the Genome Project, is that they express structurally distinct sets of rRNA depending on their developmental stage. This has a profound effect on the ability of the parasite to synthesize proteins and on its capacity to progress to the next stage of its life cycle. In Chap. 9, T.F. McCutchan, R. van Sapendonk, C. Janse, J. Fang, and A.P. Waters review the different rRNAs, focusing on regulation of their transcription and processing during the parasite life cycle. Chapter 10 deals with the control of the parasite cell cycle in the different developmental stages. C. Doerig and D. Chakrabarti explain how the complex multi-stage life cycle of the parasite progresses, and the involvement of cyclins, cyclin-dependent kinases, and other factors in controlling this progression. One of the most distinctive features of the organisms of the phylum Apicomplexa is the existence of an intracellular ancient endosymbiont, known as the apicoplast. This semi-autonomous organelle has its own genome and expression machinery and is involved in several metabolic routes, making it an excellent target for anti-parasitic drug development, as explained in detail in Chap. 11 by R.F. Waller and G.I. McFadden. The apicoplast's interesting structure, phylogenetic origin (a red alga), function, contents, protein-targeting properties, and mechanisms of transmission to *Plasmodium* progeny are also described.

Plasmodium parasites interact with a wide variety of host cells during their life cycle via ligands displayed by the parasite that specifically bind to counterparts on the surfaces of host cells. These molecules are good candidates for vaccine development since immune responses mounted against them could protect the host organism from infection. In Chap. 12, J.D. Smith and A.G. Craig review the features of these important molecules and the mechanisms of antigenic variation that the parasite has developed to evade immune recognition. A vaccine directed against the blood stages of *Plasmodium* will not prevent infection by the parasite but will attenuate or eliminate the symptoms associated with malaria, a therapeutic strategy much needed by inhabitants of countries constantly exposed to such a threat. The merozoite is the only form among the blood stages of the parasite that is found in the blood-stream outside host cells. Thus, an efficient immune response to the merozoite or new drugs targeted against it will impede erythrocyte invasion, thus avoiding continuation of the infection to the pathological stage. In Chap. 13, A.E. Topolska, L. Wang, C.G. Black, and R.L. Coppel review the cell biology of the merozoite, especially proteins crucial to this parasitic stage.

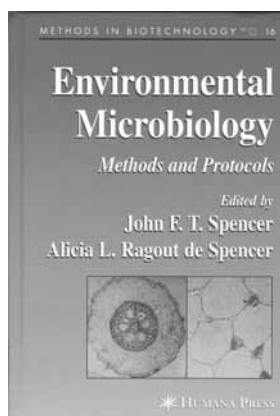
Chapter 14, written by the editors of the book, C.J. Janse and A.P. Waters, discusses the sexual development of the parasite and the possibility of generating a transmission-blocking vaccine that, by targeting proteins expressed during the sexual stages or by the zygote, would interrupt the life cycle of the parasites during their final stages inside the mammalian host. This approach is further discussed in Chap. 15 (by R.E. Sinden et al.), which deals with formation of the ookinete from the zygote, invasion of the mosquito midgut, formation of the new oocyst, and the possibilities for interruption of these processes by using an ookinete-derived transmission-blocking vaccine or by administering anti-malarial drugs that would target the sporogonic stages. The final chapter, by K. L. Waller, S. Lee, and D.A. Fidock, is devoted to the resistance of *P. falciparum* to the drug that has been considered the gold standard in the treatment of malaria for more than 50 years: chloroquine. A mechanistic model of resistance is provided and several key questions are raised, the answers to which will provide a better understanding of the mechanism of resistance to chloroquine as well as to other quinoline drugs and related antimalarials.

The book presented here offers a first-rate overview of the current status of *Plasmodium* and malaria research, reviewing the answers that specialists have given to key questions raised about these parasites and the devastating disease they cause, through the analysis of the genome and the molecular biology of *P. falciparum* and other species of *Plasmodium*. Although we highly recommend this book, data related to one of the key stages for intervention against malaria, i.e. sporozoites, are somehow missing. Sporozoites are the initial infective forms of *Plasmodium*, and their elimination would prevent the development of malaria. Hopefully, a discussion of sporozoites will appear in the next edition of this book, thereby further broadening readers' knowledge about this parasite, which is presently one of the main infectious killers of the human species.

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Environmental microbiology. Methods and protocols

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2004. Humana Press, Totowa NJ, USA
424 pp, 23.5 × 15.5 cm
Price: US\$ 125.00
ISBN 1-58829-116-2

Environmental Microbiology. Methods and Protocols describes the major molecular and biochemical techniques currently applied to the study of microbial communities. This volume, part of the *Methods in Biotechnology* series published by Humana Press, offers detailed presentations of several techniques that are of interest to researchers in the field of environmental microbiology. The book is divided into four sections: *Communities and biofilms*, *Fermented milks*, *Nucleic acids, recovery, and determination*, and *Reviews*.

The first section, *Communities and biofilms*, discusses several representative techniques used to elucidate biodiversity and to monitor microbial communities in the environment. It deals with the study of bacteria from different environments, including marine bacteria, ground-water microorganisms, and yeasts, by means of molecular characterization and microscopy. Each methodology is clearly explained and the principles can be readily understood, even by researchers outside the particular field. The analytical methods detailed in this section are accurately described and may be reproduced without major problems. In addition, the data analyses are very well-documented. However, the introductory chapters are short and do not really address the applications and limitations of each technique. Also, while the chapter dealing with methods for studying marine bacteria is thorough in its presentation, it lacks additional information about the different culture media for isolating bacteria from seawater or about the novel methods involved in studying the biodiversity and ecophysiology of planktonic microorganisms, i.e. microautoradiography-FISH, real-time PCR, DNA microarrays, etc. The chapter describing reverse sample genome probing (RSGP) and DNA quantification by flow cytometry is the most innovative of this section, and offers new approaches to monitoring complex communities. The in-depth descriptions of terminal restriction fragment length polymorphism (T-RFLP) and molecular characterization of microbial communities by 16S rDNA are quite informative, and the authors highlight the applications of these well-known tools for studying biodiversity in microbial communities. The

last two chapters focus on vital staining methods and imaging of biofilms using fluorescent markers and confocal laser scanning microscopy (CLSM). These techniques considerably broaden the study of complex communities by introducing novel perspectives into classical microbiological methods such as staining and microscopy.

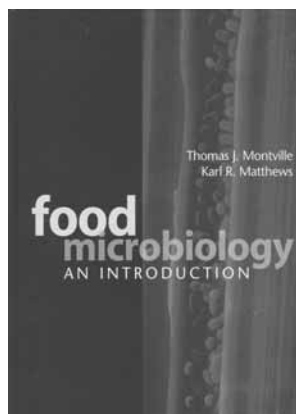
Fermented milks is the shortest section, comprising only four chapters (the book has 38 chapters). Nonetheless, the descriptions of several analytical techniques for assessing the status of lactic-acid bacteria in fermented products provide a wealth of information. Chapter 11 places special emphasis on enzymatic assays of fermented products; it also describes new methods to extract enzymes from fermented milks and to perform enzymatic determinations. The other chapters of this section are more specific and deal with exopolysaccharide (EPS) and oligosaccharide determinations in fermented products. Although this part of the book covers subjects hardly discussed in this field, one wonders why a section on the analysis of fermented milk was included in a book titled "Environmental microbiology".

Nucleic acids, recovery, and determination consists of 20 chapters that cover the latest techniques for the description and assessment of microbial communities in situ. Chapters dealing with methods for the study of microbial diversity emphasize the use of DNA-based techniques, including new methods, to obtain microbial nucleic acids suitable for further analyses. Much attention has recently been focused on techniques such as random amplified polymorphic DNA (RAPD), rRNA intergenic spacer regions, DNA-DNA hybridization and denaturing gradient gel electrophoresis (DGGE). These are described in great detail, but neither their limitations nor the analyses or future applications are discussed. An exception is Chap. 32, on the use of DGGE for examining complex communities, in which the ability to determine population structure and dynamics by hybridizing denaturing gels with DNA probes is discussed. Other chapters in this section are devoted to the evaluation of enzymatic activities of yeast and pathogenic fungi, and provide a useful overview of the industrial applications of enzymes. The enzymatic analysis procedures are well-described, but a discussion of the problems of enzyme purification and characterization would certainly have been of interest. The chapters on the chemical determination of environmental contaminants and the use of isotopic analyses (^{13}C and ^1H nuclear magnetic resonance, NMR, Chap. 18) to evaluate the dynamics of certain metabolic compounds in microorganisms may be of particular interest to microbial ecologists, as these methods would also be an interesting approach to determining the prevalence of specific substances in complex matrices.

In terms of the overall organization of the book, several of the chapters, particularly those presenting recent methods, would have benefited from a more detailed presentation of their

topic. *Reviews* is a very useful part of this book and the discussions well-illustrate the principles, limitations, and applications of the different techniques discussed in the preceding sections. The simplified diagrams included in each chapter are helpful, particularly in those sections that include mathematical equations. In addition, the tables are well-organized and the data are easily accessible. My only criticism relates not to the book itself, which provides an updated guide to techniques useful for environmental microbiologists, but rather to the organization and distribution of its chapters.

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Food Microbiology: An Introduction

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2004. ASM Press, Washington DC, USA
396 pp, 29 × 22 cm
Price: US\$ 79.95
ISBN 1-555581-308-9

According to the Greeks, four elements define life's basic necessities: water (metabolism), air (respiration), fire (temperature-heat), and earth (food). However, the first three elements exclude the presence of organisms, since, as stated by Shelford's law of tolerance, there are limits to environmental factors above and below which organisms cannot survive. The fourth element, the earth, or food, regulates the number of organisms according to Liebig's law of the minimum: any population living within a discrete area consumes food, a process that ultimately leads to starvation. Before 10,000-20,000 years ago, humans were nomadic hunters and gatherers, continuously concerned with the search for food. The so-called Neolithic Revolution led to the domestication (from Latin, bringing it home) by humans of plants, animals, and microbes. Farming and cattle-raising contributed to the availability of a steady food supply, which was in part dependent on an appreciation of the ability of microbes to preserve certain foods, such as milk (cheese, buttermilk, and yogurt) and meat (sausage).

Food Microbiology: An Introduction provides an accessible understanding of the skills necessary to insure food safety. It makes use of valuable pedagogical tools, such as learning objectives, summaries, and questions, to reinforce the concepts discussed in each chapter. As the book's name indicates, it is an introduction and thus avoids excessive details that only an expert needs to know. Nonetheless, it covers major topics, such as food ecosystems that influence microbial growth, microbial methods, both traditional and automated, pathogenic bacteria, viruses, and molds, and the control of microorganisms. The current volume is based on an excellent previous food microbiology book, also published by ASM Press: *Food Microbiology. Fundamentals and Frontiers*, 2nd edn, 2001, edited by M.P. Doyle, L.R. Beuchat, and, one of the two authors of the present book, T.J. Montville.

The book is organized in five major sections. Section I, *Basics of food microbiology*, contains information on the recognition, quantification, and evaluation of the presence of specific microorganisms in foods. Sections II and III are devoted to pathogenic gram-negative and gram-positive bacteria, respectively. The basic biochemical characteristics of several food-borne bacterial pathogens are described, allowing identification of the particular microorganism as well as an understanding of the conditions in foods that favor microbial growth. In addition, the appropriate interventions to combat food-borne bacterial pathogens and the functional mechanisms of the virulence factors that cause food-borne illness are discussed. Since the basis for ensuring food safety for the consumer depends on the testing of foods for pathogens and spoilage-causing microorganisms, microbiological criteria are used to distinguish between acceptable and unacceptable products as well as between acceptable and unacceptable food-processing practices.

Section IV, *Other microbes important in food*, not only describes viruses, prions, and molds as spoiling and pathogenic organisms, but also points out the importance of other microorganisms that have applications in the food industry, e.g., dairy fermentation, the production of fermented vegetables, and meat fermentation. Section V, *Control of microorganisms in food*, describes the strategies of ensuring safe food. The authors propose chemical control based on the use of preservatives, such as organic acids, but also biologically based preservation, including probiotic bacteria. While consumers are generally wary of preservatives, they accept the use of lactic acid bacteria (used as probiotic), which can protect refrigerated foods, as natural and health-promoting. In fact, fermentation by lactic acid bacteria may be one of the oldest forms of food preservation. Physical methods of food preservation, such as the effects of temperature, irradiation, and hydrostatic pressure on microbial growth, are also described. The last chapter, which is no less important, is concerned with the implementation of good manufacturing practices and the application of a proper sanitization.

tion program, which must include maintenance of buildings, fixtures, and other physical facilities; pest control; sanitation of food-contact surfaces; air sanitation; and the handling of cleaning equipment and utensils. Both sanitation practices and the education of food-handlers determine the development of an effective HACCP (Hazard Analysis Critical Control Point) program for the food industry. The HACCP goal is to minimize contamination by establishing control procedures at certain critical points along the chain of food processing, from "farm-to-folk". The book's overall focus is on measures to prevent and control food-borne disease microorganisms and on the characteristics of the major pathogens. For this reason, the short discussion of "good microorganisms" (*Fermentative organisms*), described in Section IV, Chap. 18, could have been omitted, or perhaps instead included as a short note (e.g. as a text box) in the book's introduction or in an Appendix. In Section V, a discussion of the disinfectants currently used in industry sanitation should have been included.

Food Microbiology: An Introduction is a textbook recommended for undergraduates but it can also be read by anybody interested in microbiology, and especially food microbiology. The teaching function of this book already begins with the cover photo, a scanning electron micrograph showing *Listeria monocytogenes* cells attached to a stainless-steel surface, which well-illustrates a sanitation problem that is plaguing the food, pharmaceutical, and clinical environments with increasing frequency and severity: the build-up of bacterial biofilms.

Uncontrolled and unwanted microbial growth destroys vast quantities of food, causing significant economic losses as well as a tremendous loss of nutrients. Moreover, the consumption of food contaminated with particular microorganisms or microbial products can also cause serious illness, such as food-mediated infections and food poisoning. With a current global population of more than 6000 million individuals, a staggering 6-60 thousand million annual cases of gastrointestinal illness are estimated to occur. Every minute, there are over 50,000 cases of gastrointestinal illnesses, and many individuals, especially children, die from these infections. Indeed, the estimated number of deaths worldwide from diarrheal diseases alone is over 2 million. Food safety may be enhanced by minimizing contamination at levels high enough to cause disease at every subsequent step, from food production and processing to distribution, preparation, and consumption. Common examples include improper disposal of manure on farms, use of contaminated water to wash products, and inadequate refrigeration of food products. *Food Microbiology: An Introduction* is a small but significant contribution to detecting, and perhaps even to solving, some of these problems.

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Cartas a Nuria. Historia de la ciencia

RAMON PARÉS

2004. Almuzara Estudios, S.A.,
Córdoba, Spain
377 pp, 24.5 × 18 cm
Price: 20.00
ISBN 84-933378-6-2

What is the most efficient way to communicate knowledge in any field? Surely there is more than one. Traditionally, knowledge has been taught in classrooms and compiled in books, manuals, encyclopedias, etc. Of the different ways to convey scientific knowledge, Ramon Parés, Microbiology Professor Emeritus of the University of Barcelona, Spain, has chosen the form of letters addressed to his daughter Nuria, gathering them together in the book *Cartas a Nuria* ("Letters to Nuria"). At the time he wrote the first edition of this book (in Catalan, between 1983 and 1985), the author's daughter was completing her doctorate at the University of Montpellier, France.

Although the epistolary genre has been considered a minor one compared with novels and other literary forms, there are several examples of authors who have chosen the form of letters. In the Christian tradition, Saint Paul was a prolific letter-writer, as he found them to be the best way to transmit the faith that was revealed to him after a very painful fall from a horse. Ovid (43 BC-AD 17), a major Roman poet, also used the epistolary genre to write *Heroides*, which consists of imaginary letters written between mythological lovers. Madame de Sevigné (1626-1696) is mostly known in French literature by the letters she addressed to her daughter and intimate friends, describing, among other things, her readings. A relatively more recent (1869) example, the charming *Les Lettres de mon moulin*, by Alphonse Daudet (1840-1897), is another example of sensitivity and accuracy in transmitting the pleasure of achieving knowledge and experience.

Throughout history, letters have been also a means for communicating scientific knowledge and discoveries, especially before the advent of scholarly journals. Robert Boyle (1627-1691), a key figure of modern Western science and seventeenth-century English culture, corresponded with more than 300 men and women, most of them major European intellectuals of the time. Antony van Leeuwenhoek (1632-1723) kept a correspondence with the Royal Society that lasted for about fifty years. In his letters, he accurately described the observations he had made using his special

lenses, and those letters were printed by a wise publisher as “Opera Omnia”, or “Arcana Naturae Detecta”, the only “book” Leeuwenhoek ever wrote.

The knowledge that Parés wanted to communicate to his daughter was the history of science, knowledge of which he and most cultivated people consider to be essential in order to understand the scientifically oriented world of today. Science, and its development and evolution, is the history of human thought as well as a record of the influences of many events, including natural changes and disasters, that have affected the Earth and its inhabitants over time. The merit of this book is that, although addressed to an educated person with a solid scientific background, its style will also invite the interest of the intellectually curious lay person. This matter is explicitly addressed by the author when, at the end of letter number 10, he writes to his daughter, “I hope to have contributed to awakening your intellectual curiosity.” This is an important feature of *Cartas a Nuria*: it reveals the essentials of the history of science, in a plain and simple way, hoping to awaken the interest of the readers such that they are motivated to search for additional sources, data, and interpretations.

As explained in the Foreword of this edition, the book is grouped into two parts, the first one forms the core of the book and is devoted to the history of Western culture. It ranges from the pre-Socratic philosophers to the relativist mechanics of the twentieth century. The second part of the letters comprises introspections of the author regarding crucial issues concerning the sciences, including the theory of paradigm, evolutionary epistemology, other modern elements, such as computers, and even local events, e.g. the role of the so-called School of Chemistry of Barcelona at the beginning of 19th century and the 50th anniversary of the Faculty of Biology of the University of Barcelona. Those are institutions that the author knows very well by having actively participated in their development throughout the years he devoted to the University of Barcelona as a professor and researcher.

The original edition of this book was published in Catalan in Barcelona in 1985, before the importance of the public’s understanding of science was considered in Spain. But some authors, Pares among them, write books that reveal a previously unrecognized need and that—on a small scale, considering the size of the Catalan-speaking population—are able to generate a strong demand. The current version of *Cartas a Nuria* is more than a mere translation from the Catalan first edition; it is the result of close work between the author and the translator, Josep Casadesús, Professor of Genetics at the University of Sevilla. Casadesús combines his scientific expertise with his deep interest and knowledge of the humanities. Ideally, all translations in literature—either general or

scientific—would benefit from the same opportunity of direct communication between author and translator. Both Parés and Casadesús have practiced the ideal of a *single culture*, in which the artificial separation of knowledge according to its scientific, technological, and humanistic sources is overcome, thereby exposing the natural, underlying connections between these branches of human endeavor. Thus, the Spanish edition of *Cartas a Nuria* is clearly the fruit of extensive dialogue, discussion, and interpretation between author and translator.

Cartas a Nuria consists of two parts. The first is divided into several sections: *Classic Period* (18 letters), including Mileto School, Hypocrates, Aristotle (“the man who knew everything”, as the author writes), Galen, and the Alexandrian School. Readers will benefit from the author’s effort to relate and situate each name and circumstance in the general historic and social context of the time. *Middle Ages* (5 letters) considers two main aspects, Arabic culture and the appearance of Islam, and the influence and spread of scholastic thought, mainly in the first universities. *Renaissance* (4 letters) deals with the environment that prepared the way for what came to be considered *The Scientific Revolution* (23 letters), and the section devoted to the latter is the longest part of the book. It starts with Galileo and Kepler and covers the different periods of science history until the first half of the twentieth century. The ten letters in the second part of the book expound on different concepts and the impact of recent events.

Like many Spanish books, this one lacks an alphabetic index, which makes it difficult to find mention of specific topics and people. Also, a suggested reading list would have been useful. In spite of such minor editorial flaws, the book is excellently printed, its typography is elegant and clear, and the general nature of the book is thoroughly enjoyable. The efforts of Editorial Almuzara, from Córdoba, Spain deserve recognition. The general appearance of a book is also important to devoted readers, for whom the cover design alone is often enough to awaken their curiosity, interest, and even a sense of discovery. Obviously, the content is what matters the most, but even the cover of this edition contributes to making *Cartas a Nuria* an excellent example of a book that, despite its weighty subject matter, the History of Science, nonetheless succeeds in engaging the interest of a wide range of readers.

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